REMARKS

Claims 1 through 7 and 13 through 86 (which are now renumbered properly to 17-90) were presented for examination. Claims 22, 24, 27, 29, 31, 33, 35, and 38-49 have been canceled. All of these claims were rejected under Section 102(e) as being anticipated by Schmidt et al. ('905), Guan et al. ('188), or Engehausen et al. ('098). Claims 1 and 7 have been amended to incorporate the chain length of 4 to 100 carbon atoms for the product alpha olefins which is described on page 29, lines 5-9, of the specification; and to include the temperature and pressure ranges which are described on page 27 and in cancelled claims 18, 20, and 40. Claims 23, 25, 27, 29, 31, and 34-45 have also been cancelled. Claims 13 through 86 have been amended to correct the numbering of those claims. Claims 91 through 94 have been added to more particularly point out one of the preferred embodiments of the present invention, i.e. that the alkyl-branched alpha olefins have the structure described at the bottom of page 9 carrying over to the top of page 10 of the specification. The Examiner's rejection is respectfully traversed.

The '905 reference relates to a process for the oligomerization and polymerization of ethylene or other alpha olefins. It does not describe the co-oligomerization of ethylene together with one or more alpha olefins other than ethylene as is described in all of the claims of the present application. For this reason alone, the claims of the present application cannot be anticipated.

In the description of the oligomerization process of the '905 reference, the feedstocks which are to be used include many of the intended products of the presently claimed process (see column 11, lines 26-34). The products which are made according to the process of the reference are relatively high molecular weight materials (see Table III wherein the number average molecular weight of the 23 products characterized range from 4051 to 13,980 and the weight average molecular weight ranges from 15,320 to 499,500; the undersigned has been informed that these materials range from a C_{144} species to a C_{499} species. These materials are not the intended product of the present invention and this is emphasized by the amendment of all of the claims to incorporate that the chain length ranges from 4 to 100 carbon atoms.

Another indication that the '905 process is intended to and does make higher molecular weight materials is the use of hydrogen in all of the reactions to control the reactions. If hydrogen were used in the process of the present invention, the yield of the desired alpha olefins would be decreased. However, when the products are polymers or high molecular weight oligomers, the fact that they are olefins or paraffins (which would be created by hydrogenation in the presence of hydrogen) is not particularly important.

The amended claims specify that the ethylene pressure of the process should range from 0.1 to 1.6 MPa. This is the preferred pressure range described at page 27, line 13, of the specification. In the '905 examples which relate to the ion-containing catalyst used in the process of the present invention, Examples 9 through 20, the minimum ethylene pressure used was 265 psig. This is determined by subtracting the hydrogen pressure from the reaction pressure given in Table IV at column 27. According to column 12, lines 37-40, the remaining pressure was the ethylene pressure. 265 psig is greater than 1.7 MPa and thus the pressure used in all of the relevant examples of '905 was outside of the pressure range specified in claims 44 through 49. Thus, '905 cannot anticipate those claims.

In Example 1 of '188, the ethylene pressure was 2.06 MPa (column 12, lines 5-13 - 2.41 MPa total pressure - 350 kPa [.35 MPa] = 2.06 MPa). The ethylene pressure in Example 2 was 1.24 MPa. However, as discussed above, the process described by these examples and in this reference is a process for producing polymers and not for producing alpha olefin oligomers having a chain length of 4 to 100 carbon atoms. This reference cannot anticipate the present invention as presently claimed.

The Examiner refers to Example 36 through 38 of '098 as the basis for the anticipation rejection. Since Examples 37 and 38 do not even relate to the polymerization of ethylene (since only propene is used), must less the oligomerization of ethylene, these examples are irrelevant. Only Example 36 describes the polymerization of ethylene. This polymerization is carried out with propylene. The propylene pressure is 5.7 bar and the ethylene pressure was 0.3 bar. 0.3 bar corresponds to 0.03 MPa and thus the ethylene pressure of example 36 was outside of the scope of the claims and those claims cannot be anticipated by '098.

The Applicants assert that the '188 reference is entirely irrelevant with respect to the presently claimed process. '188 describes a two-step method for producing polymers and copolymers of ethylene and other alpha olefins, particularly those having an odd number of carbon atoms. The first step of the process of '188 is the oligomerization of ethylene and that the co-oligomerization of ethylene and an alpha olefin other than ethylene which is the process of the present invention.

The only examples given of how to carry out the process of '188 are Examples 1 and 2. In each case, ethylene (and in Example 1, propene) was treated simultaneously with an oligomerization catalyst and a polymerization catalyst to produce a polymer. In Example 1, it is stated that the "polymer" had a melting point of 124°C" and that the "density was 0.891 g/mL based on IR." In Example 2, "white polymer (24.87 g) was obtained." The number average molecular weight of the polymer made in Example 1 is said to be 5464 and the weight average

molecular weight is said to be 31,744. Clearly this is a high molecular weight material and the undersigned has been informed that it corresponds to a material having at least 390 carbon atoms in the chain (the weight average molecular weight produced 2267 carbon atoms in the chain).

Clearly then, the '188 reference does not anticipate the present claims of the application because they describe a process for making an alpha olefin with a chain length of from 4 to 100 carbon atoms and the reference describes a process for making much higher molecular weight materials–polymers and copolymers.

The '098 reference is also directed to the polymerization of alpha olefins and thus is not relevant to the present invention which describes a process for oligomerizing ethylene and an alpha olefin other than ethylene to produce alpha olefins having a chain length of from 4 to 100 carbon atoms.

The Examiner has cited Examples 36 through 38 as being novelty destroying. However, Examples 37 and 38 are only concerned with the polymerization of propylene and have nothing at all to do with the co-oligomerization of ethylene with one or more alpha olefins other than ethylene. Also, the undersigned has been informed that the molecular weight information for the products of Examples 37 and 38 correspond to materials having 4071 carbon atoms and 278 carbon atoms, respectively. These materials are well outside the range of materials made by the process of the present invention. Claim 36 does utilize ethylene. It describes a process for polymerizing ethylene with propylene to make "12.45 grams of copolymer." The undersigned has been informed that the molecular weight information given for the product of Example 36 corresponds to a copolymer chain having approximately 180 carbon atoms. This is also well outside the range of products made by the process described in the claims of the present application. Furthermore, the process described in Example 36 can only produce a random copolymer of ethylene and propylene and since the propylene is incorporated randomly into the copolymer, the copolymer would have multiple branches with branching occurring at random points along the polymer chain. This product is substantially different from the products made according to the process of the present invention which are linear alpha olefins and branched alpha olefins wherein the branching must be at the second or third carbon atom form the end of the chain of the alpha olefin.

For the reasons discussed above, the Applicants assert that the anticipation rejection based on the foregoing references should be withdrawn. These references simply do not describe all of the features of the present invention. They do not describe a process for making alpha olefins of the type described in the present application but rather describe processes for making higher molecular weight materials.

Claims 91 through 94

The Applicants assert that claims 91 through 94 are patentable independently of the patentability of the other claims present in this application. These claims describe process for making alpha olefins of one of the two particularly specified general structures described in those claims. Branched alpha olefins having these structures are not described in any of the cited references.

Summary

The claims have been amended to specify a process for producing alpha olefins having a chain length of 4 to 100 carbon atoms and to describe the preferred pressure range for operation of the process of the present invention. Claims 91 through 94 have been added to describe the structure of the branched alcohols which are made according to the process of the present invention.

Other references refers to a process for the oligomerization of C_4 to C_{100} alpha olefins--whether they all relate to the polymerization of ethylene or the oligomerization of ethylene to high molecular weight oligomers outside the scope of the present claims. The only one of the examples of any of the cited references which describes a pressure within the preferred pressure range described in the claims is Example 2 of '188. Since that example describes the process for the simultaneous oligomerization of ethylene and polymerization of olefins with other alpha olefins having an odd number of carbon atoms to produce polymers having a molecular weight higher than the materials intended to be made by the process of the present invention, the claims are independently patentable. The branched olefin structures described in claims 91 to 94 are not described in any one of the cited references.

Respectfully submitted,

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